

Know Your Fibers: Cotton vs. Viscose Rayon

The goal of our [Know Your Fibers series](#) is to provide up-to-date educational information about different types of fibers for our Barnhardt readers. In this post, we'll take a look at how cotton compares to viscose rayon.

Learn More:

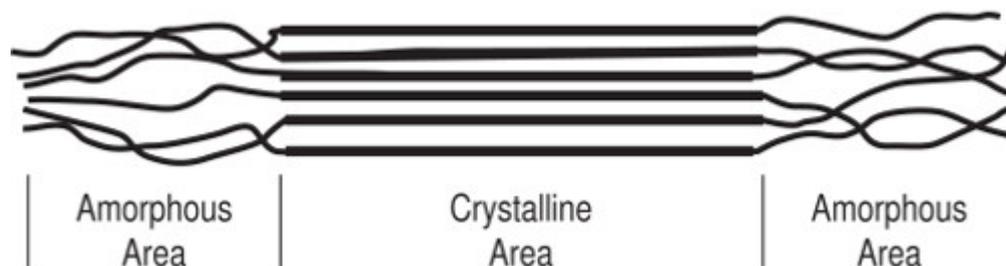
- [Q and A: What Is Viscose?](#)
- [Don't Get "Bamboozled" by False Bamboo Advertising](#)
- [Infographic: Cotton Vs. Rayon Production Steps](#)
- [The Cotton Advantage](#)
- [Cotton Processing](#)

While cotton and rayon fibers are both made from the same polymer (cellulose), cotton's cellulose is [grown in five to six months by plants](#). Rayon's cellulose is produced from trees, which require a much longer time (years) to grow before

they are big enough for harvesting. Some of the tree-related facts with regard to viscose rayon are chilling—while cotton plants are replaced seasonally on the farm, pine trees, for example, take 25-35 years to regenerate after harvesting for viscose rayon. Furthermore, [nearly 30 percent of the viscose rayon used in the fashion industry are harvested from ancient and endangered forests worldwide.](#)

The harvested trees go through a [harsh chemical process](#) to remove everything (bark, lignin, etc.) but the cellulose, and then the remaining cellulose is regenerated into man-made fibers. Since the molecules in cotton consist of longer cellulose chains than those in rayon cellulose, the longer cotton molecules are also packed more in-line (crystalline areas) with each other than rayon's more random (amorphous areas) molecules. Both of these molecular qualities combine to make cotton fiber much stronger than rayon fiber.

Amorphous and Crystalline Areas of Polymers



Unique Properties of Cotton

The same two molecular properties also lead to the amazing fact that cotton fibers increase in strength when wet, whereas viscose rayon fibers lose strength when wet. Improved wet strength is important for nonwovens like dry wipes that are used to absorb spills, and also for added strength in pre-moistened wet wipes. Higher wet strength is also an asset for medical products that are used to clean and protect, absorb bodily fluids, and even to support organs during surgery.

Regenerated Fibers Are Not Natural

[Cotton fibers](#) come from plants and there are many varieties of seeds used to grow it. The type of cotton seed used is primarily determined by the conditions in the area where it is planted (wet, dry, short or long growing season, etc.). Many farmers use genetically-modified cotton seed to grow a hardier plant that may better withstand the elements and require less chemical application (fertilizer, pesticide) during the growing season. Of course, a small but growing contingent of farmers go the all-natural route and grow cotton exclusively via organic techniques.

Viscose rayon can be produced from any number of trees, grasses or even cotton, as they all get their strength from cellulose. Some rayon fibers are produced using [bamboo](#) (which is a grass) as the cellulose donor. In recent years, some manufacturers made false claims, labeling rayon fibers made from regenerated bamboo plants as natural. But when a fiber is made from regenerated bamboo, it is not, in fact natural. The Federal Trade Commission took action, requiring manufacturers to remove the “natural” labeling.

Locally Grown & Processed

While cotton is grown all over the world, the largest share of the market is produced in China, India, and the United States. [The US market, representing producers along the southern tier from Virginia to California, is the global standard-bearer for quality.](#) There are no producers of viscose rayon in North America. For every pound of fiber harvested, there are roughly 1.6 pounds of other useful products being created, such as cottonseed oil, cattle feed, and mulch. In fact, over the last 20 years modern cotton farming techniques have [reduced the energy used by 66%](#). In addition, over those two decades water usage has been reduced by 49%, carbon dioxide emissions has been lowered by 33%, and soil loss has decreased by 34%. All

of this has occurred while new seed varieties have reduced the amount of pesticides used by 23%. With cotton farming techniques, less will always mean more, especially when it comes to [sustainability](#).

While cotton is locally grown and harvested by conservation and sustainability-minded producers and manufacturers here in the USA, viscose rayon is produced from cellulose harvested from trees in the developing world and processed in high-polluting manufacturing facilities primarily located in China, India, and Indonesia.

Purified Cotton vs. Viscose Rayon Production Steps

Let's look at the steps involved in producing purified cotton and viscose rayon, as depicted in the graphic below. While viscose rayon can be made using any raw scour of cellulose, the vast majority produced commercially uses trees. If you make a side-by-side comparison of cotton and tree-sourced viscose rayon, you can quickly ascertain that the viscose process involves nearly three times the number of steps as those in cotton fiber production.

Not only is the cotton production process far less complex, it's also cleaner. Cotton production requires fewer chemicals and generates less waste. The source plant is annually renewable on the farm, while trees take a generation to replace. Cotton is the environmentally-friendly choice, and it's the preferred fiber by consumers for a variety of applications, from clothing to bedding, bath towels, furniture, personal hygiene and baby products.

PRODUCTION STEPS

Purified Cotton and Viscose Rayon Fibers



COTTON

- 1 Harvest Plants
- 2 Ginning
- 3 Opening/ Cleaning/ Cake Making
- 4 Alkali Scouring
- 5 Purifying
- 6 Finish Application
- 7 Drying & Baling

A NATURAL FIBER WITH A SIMPLE PROCESS

Benefits of Cotton:

- Less chemicals
- Less waste
- Annually renewable
- Largely grown with natural rainfall
- Eco Friendly
- Consumer preferred



RAYON *(from trees)*

- 1 Harvest Trees
- 2 Debarking
- 3 Chipping
- 4 Chemical Processing
- 5 Hydra-pulper
- 6 Blending
- 7 Screening & Cleaning
- 8 Wood Pulp Steeping
- 9 Wood Pulp Shredding
- 10 Aging
- 11 Xanthation
- 12 Dissolving
- 13 Ripening
- 14 Filtering
- 15 Degassing
- 16 Wet Spinning
- 17 Drawing
- 18 Finish Application
- 19 Cutting & Baling

STAGE 2
PULP MILL

STAGE 3
VISCOSE RAYON
PRODUCTION

A REGENERATED FIBER WITH A COMPLEX PROCESS

Knowing your fibers means understanding everything about them, from how they are farmed to their distinct properties in a variety of situations. For those looking for a truly natural product that's soft, absorbent, and strong—even in when wet—cotton is the clear answer.

Editor's Note: This article was first published in December 2013 and has been updated for accuracy and comprehensiveness.

Keep Reading:

- [Cotton Vs. Synthetic Fibers](#)
- [Cotton vs. Bamboo Viscose](#)
- [Regenerated Cotton](#)

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